

What is claimed is:

1. An article of footwear with temperature regulation means,
the article comprising:

a sole forming a bottom of the footwear;

an insole overlying said sole and in contact with said sole,
said insole having in an upper surface thereof
opposite from said sole a groove having an inlet and
an outlet in an edge of said insole, said groove
winding substantially throughout the length and width
of the insole upper surface with a plurality of
generally 180° turns therein

a tube disposed in the groove and extending throughout the
length of the groove and having an inlet portion
extending from the groove inlet at the edge of said
insole and an outlet portion extending from the groove
outlet at the edge of said insole;

an upper fixed to said sole and having apertures
therethrough through which extend the tube inlet and
outlet portions; and

a holding member fixed to said upper and covering the tube
inlet and outlet portions;

a liquid reservoir having temperature influencing means
therewith and connected to remote ends of the tube
inlet and outlet portions;

wherein temperature conditioned liquid is flowed from said
liquid reservoir through said tube to provide a
selected temperature to said insole, and flowed back
to said liquid reservoir for a further cycle.

2. The article of footwear in accordance with claim 1 and
further comprising a sock lining disposed over said insole.

3. Footwear in accordance with claim 1 wherein said insole is
of a breathable urethane foam sufficiently flexible to serve as
footwear insole material and sufficiently rigid to render said
groove non-compressible under typical human weight load
conditions.

4. Footwear in accordance with claim 3 wherein said tube is of
a heat-conducting polymer.

5. Footwear in accordance with claim 3 wherein said tube is of
PVC.

6. Footwear in accordance with claim 3 wherein said groove is
about 5/32 inch wide and 5/32 inch deep and said tube is provided
with an outer diameter of about 5/32 inch.

7. Footwear in accordance with claim 6 wherein said tube is provided with an inside diameter of about 3/32 inch.
8. Footwear in accordance with claim 3 and further comprising a coating of thermally activated material on the exterior of said tube.
9. Footwear in accordance with claim 1 wherein said holding member comprises a protective covering fixed to the footwear, with the tube inlet and outlet portions extending through the holding member.
10. Footwear in accordance with claim 9 wherein the footwear comprises a boot and the tube inlet and outlet portions extend up the back of the boot to proximate the top of a bootleg portion of the boot.
11. Footwear in accordance with claim 10 wherein the protective covering extends from proximate a heel portion of the boot to proximate the top of the bootleg portion of the boot.
12. The footwear in accordance with claim 3 wherein said groove is a heat and pressure die formed groove in the urethane foam.
13. An article of footwear with temperature regulation means, the article comprising:

a sole forming a bottom of the footwear;

an upper fixed to said sole;

an insole fixed to overlie an upper surface of said sole and
 overlie inwardly-extending edge portions of said
 upper;

an insert for selective insertion and removal from the
 interior of the footwear and adapted, upon insertion,
 to overlie said insole, said insert having in a
 selected surface thereof a groove having an inlet and
 an outlet in an edge of said insert, said groove
 winding substantially through out the length and width
 of the insert selected surface with a plurality of
 generally 180° turns therein;

a tube disposed in the groove and extending throughout the
 length of the groove and having an inlet portion
 extending from the groove inlet at the edge of said
 insert and an outlet portion extending from the groove
 outlet at the edge of said insert;

first and second tubes mounted on said upper and having
 first ends proximate said apertures and adapted for
 engagement with the tube inlet and outlet portions,
 and having second ends remote from said insert; and

a liquid reservoir having temperature influencing means
therewith and connected to the remote ends of said
first and second tubes.

14. The article of footwear in accordance with claim 13 wherein said insert is of a breathable urethane foam sufficiently flexible to serve as footwear insert material and sufficiently rigid to render said groove non-compressible under typical human weight load conditions.

15. Footwear in accordance with claim 14 wherein said tube is of a heat-conducting polymer.

16. Footwear in accordance with claim 14 wherein said tube is of PVC.

17. Footwear in accordance with claim 14 wherein said groove is about $5/32$ inch wide and $5/32$ inch deep and said tube is provided with an outer diameter of about $5/32$ inch.

18. Footwear in accordance with claim 17 wherein said tube is provided with an inside diameter of about $3/32$ inch.

19. Footwear in accordance with claim 14 and further comprising a coating of thermally activated material on the exterior of said tube.

20. Footwear in accordance with claim 12 wherein said holding member comprises a protective covering fixed to the footwear, with the tube inlet and outlet portions extending through said holding member.

21. Footwear in accordance with claim 20 wherein the footwear comprises a boot and the tube inlet and outlet portions extend up the back of the boot to proximate the top of a bootleg portion of the boot.

22. Footwear in accordance with claim 21 wherein the protective covering extends from proximate a heel portion of the boot to proximate the top of the bootleg portion of the boot.

23. The footwear in accordance with claim 14 wherein said groove is a heat and pressure die formed groove in the urethane foam.

24. A method for producing an article of sheet material with temperature regulation means, the method comprising the steps of:

providing a die having a generally flat surface with a rib
upstanding from the surface;

the rib winding lengthwise and widthwise of the die surface
with a plurality of generally 180° turns therein;

ends of the rib being coincident with an edge of the die and
being proximate to each other;

providing a sheet of polymer material;

applying the die surface and rib to the sheet under pressure
and sufficient temperature to cause the rib to form a
groove in the sheet; and

fixing a tube in the groove, the tube being wholly contained
in the groove and extending from one end of the groove
to another end of the groove.

25. The method in accordance with claim 24 wherein the die is of
aluminum.

26. The method in accordance with claim 25 wherein the sheet is
of methane foam.

27. The method in accordance with claim 26 wherein the die is
heated to about 400°F and is applied under pressure of about 500
p.s.i.

28. The method in accordance with claim 26 wherein the tube is
of a heat-conducting polymer.

29. As an article of manufacture, a sleeping bag mat made in
accordance with the method of claim 24.

30. As an article of manufacture, a tent floor made in accordance with the method of claim 24.